

MR2597943 (2011c:35002) 35-01

Evans, Lawrence C. [Evans, Lawrence Craig] (1-CA)

★**Partial differential equations.**

Second edition.

Graduate Studies in Mathematics, 19.

American Mathematical Society, Providence, RI, 2010. xxiii+749 pp.

ISBN 978-0-8218-4974-3

After its appearance in 1998, the first edition of the book [*Partial differential equations*, Grad. Stud. Math., 19, Amer. Math. Soc., Providence, RI, 1998; [MR1625845](#)], by Lawrence C. Evans, became an instant classic and the new standard for textbooks on PDEs. The innovative choice of contents and the mastery in their exposition by one of the outstanding experts in the area made it so. The first edition of the book has been broadly adopted by instructors in countless Math departments across the U.S. and also overseas. Since the first edition is by now widely well established and well known, I will focus on briefly reporting on some of the differences between this second edition and the first one.

The main addition to this second edition is the inclusion of a new chapter, Chapter 12, on nonlinear wave equations. Again, a most appropriate choice of material, as nonlinear wave equations continue to be the object of increasingly intensive research. Chapter 12 includes sections on the conservation of energy, the speed of propagation, and existence of solutions to semilinear and mildly quasilinear wave equations. Motivated by its physical relevance, a specific case study in 3 dimensions is carried out regarding initial-value problems for nonlinear wave equations. This includes short-time existence and blow-up in L^∞ of solutions, existence of solutions in the subcritical case, and a full section is devoted to the critical case. Examples of non-existence of solutions are presented and the chapter concludes with a list of 18 exercises and several recent references.

In addition, there are new sections and subsections to the preexisting chapters; and the list includes Subsection 4.1.2 on the applications of separation of variables and eigenfunction expansion to Turing instability, Subsection 4.3.2 on the Radon transform, Subsection 5.8.4 on Hardy's inequality, Subsection 8.2.5 on local minimizers in the calculus of variations, Section 8.6 on the invariance of variational problems and Noether's theorem, and Section C.4 (in Appendix C) on the differentiation formula for moving regions.

Also, about 80 new exercises and almost 40 new references have been added to this second edition.

This second edition of the textbook *Partial differential equations* addresses even more of the current research directions on PDEs and Professor Evans should be praised for taking the time and effort to make an already successful and wonderful book even better.

Needless to say, I recommend this book, with unreserved enthusiasm, to anyone with an interest on the study of PDEs.

Diego M. Maldonado